A. M. BAIRD & H. D. PALMER.

PNEUMATIC TRIP.

APPLICATION FILED MAR. 28, 1914.

1,143,346.

Patented June 15, 1915.

3 SHEETS—SHEET 1.

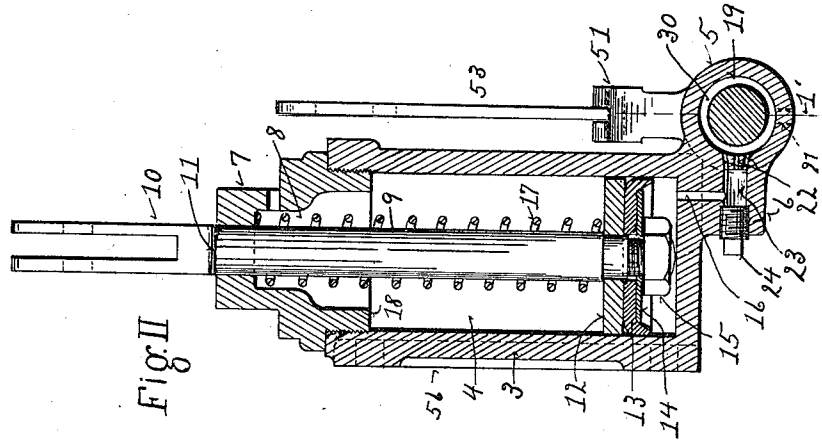


Fig. II

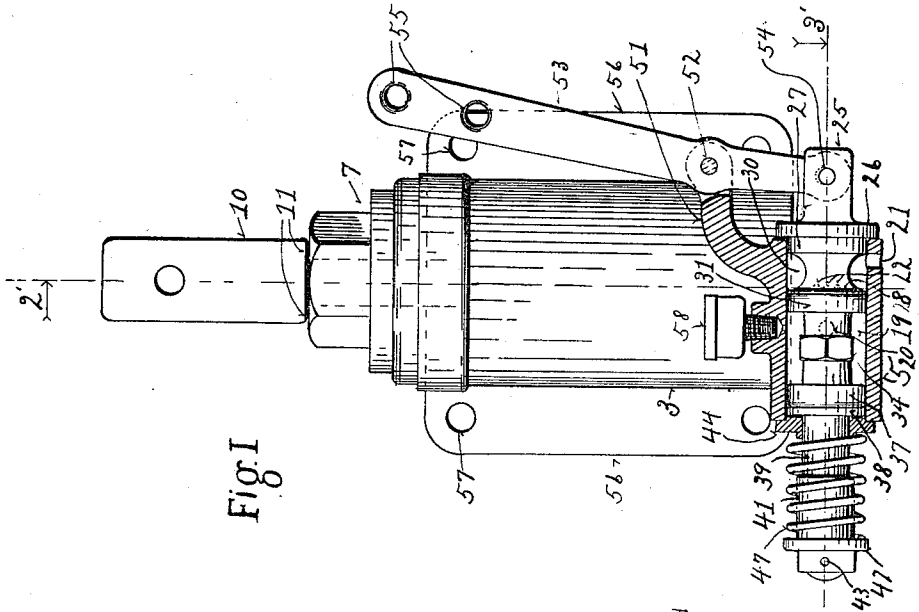


Fig. I

Witnesses

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3 SHEETS—SHEET 2.

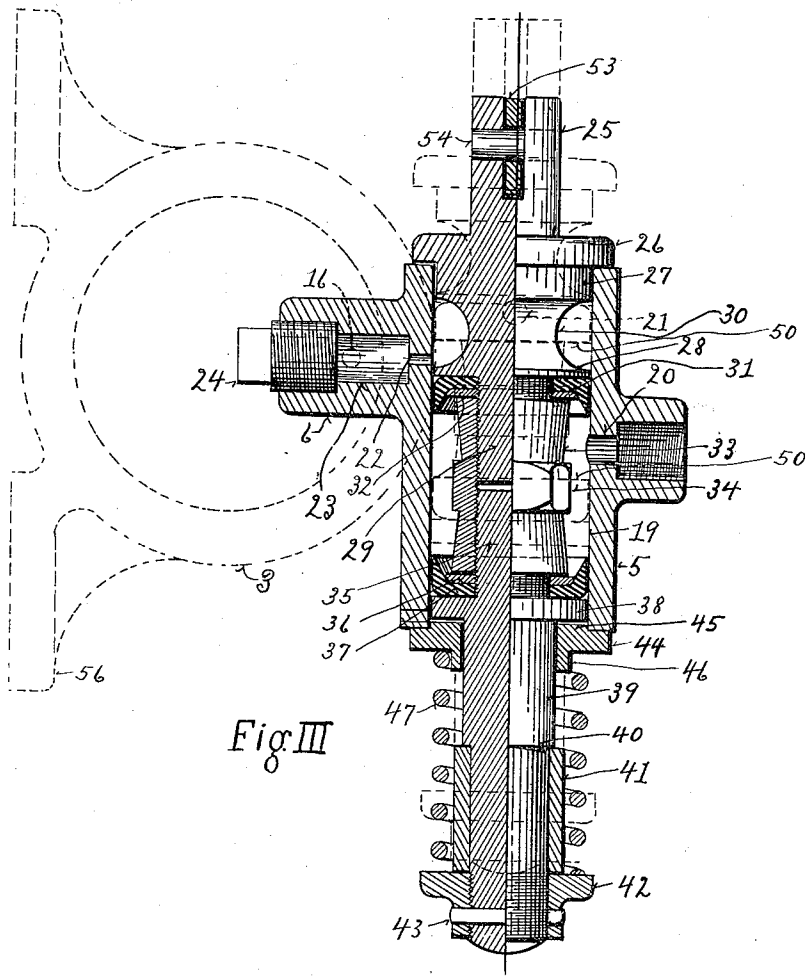


Fig. III

Witnesses

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3 SHEETS—SHEET 3.

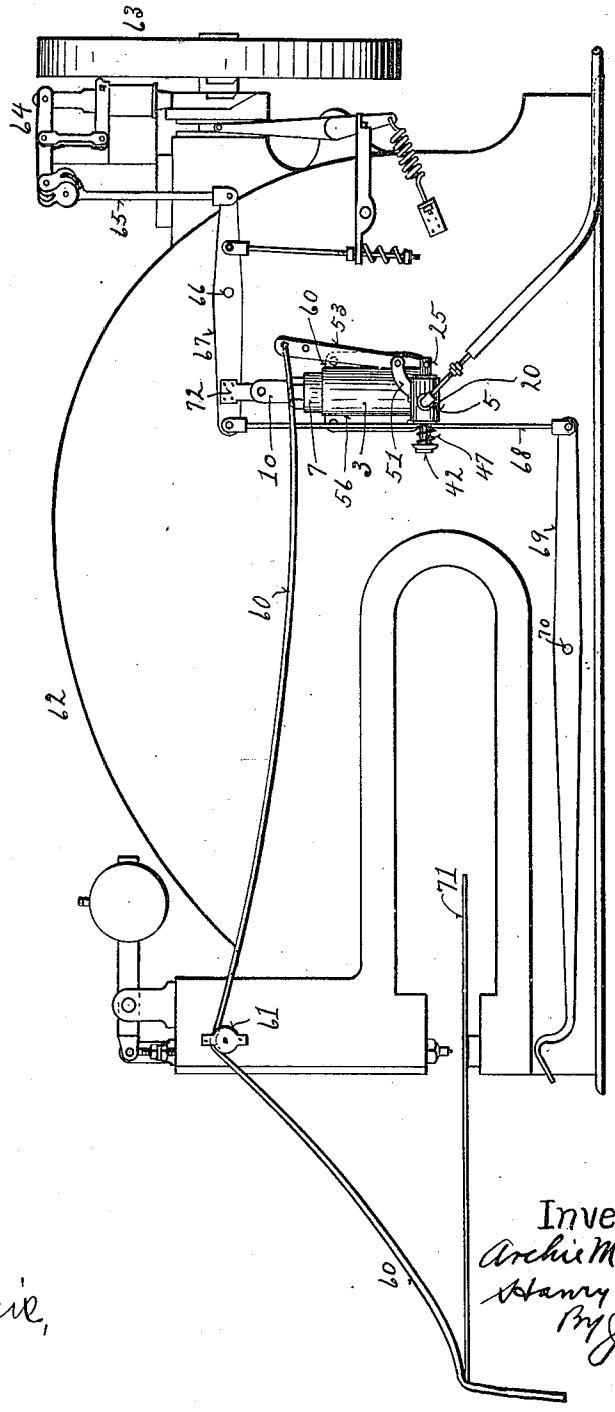


Fig. IV

Witnesses

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UNITED STATES PATENT OFFICE.

ARCHIE M. BAIRD AND HARVEY D. PALMER, OF TOPEKA, KANSAS.

PNEUMATIC TRIP.

1,143,346. Specification of Letters Patent. Patented June 15, 1915.

Application filed March 28, 1914. Serial No. 827,950.

To all whom it may concern:

Be it known that we, ARCHIE M. BAIRD and HARVEY D. PALMER, citizens of the United States, residing at Topeka, in the county of Shawnee and State of Kansas, have invented certain new and useful Improvements in Pneumatic Trips, of which the following is a specification.

Our invention relates to pneumatic trips for controlling punches, shears and other machines, and more particularly machines controlled from a distance, such machines being heretofore customarily thrown into gear or operation by means of foot or hand levers and clutches. An illustration is the case of large presses for punching large boiler plates and the like; in such case the workman attending the plate or sheet is in various positions and at various distances from the gear or clutch, and either another attendant is necessary to operate the clutch or the air which operates the clutch is conducted to the operator by lines of flexible hose for control by him. Furthermore, in the air-actuated devices of this kind heretofore used, there is waste of air both in uneconomical use thereof and in leakage through the valve.

It is the object of our invention to improve generally upon pneumatic trips; to bring the controlling valve and the working cylinder into close relation so there will be a minimum amount of waste in normal operation of the trip; to unite the working cylinder and the valve so as to make the complete device compact, and economical in manufacture; to make the device in such design as to be strong, durable, efficient, and not easily gotten out of order; to provide a pneumatic trip with a freely working valve that will not leak and that is controllable by the operator or machine attendant from any of the various positions and distances at which he may be while attending the work; to provide in a pneumatic trip a freely working and non-leaking valve that is strong, durable, simple, economical, efficient, and not easily gotten out of order; and to provide the parts, improvements, and combinations hereinafter set forth and claimed.

Our invention comprises the parts, improvements, and combinations hereinafter set forth and claimed.

In the drawings accompanying and forming part of this specification and in the description of the drawings we have shown our invention in its preferred form and what we deem to be the best mode of applying the principles thereof; but it is to be understood that, within the scope of the appended claims, we contemplate changes in form, proportions, and materials, the transposition of parts, and the substitution of equivalent members, without departing from the spirit of our invention.

Figure I is an elevation of a pneumatic trip made in accordance with the principles of our invention, the valve proper being shown in sectional elevation on a plane indicated by the line 1′ in Fig. II. Fig. II is a vertical sectional elevation on the plane indicated by the line 2′ in Fig. I. Fig. III is an enlarged sectional plan view of the valve proper on a plane indicated by the line 3′ in Fig. I, with a dotted outline showing position of the working cylinder. Fig. IV shows the trip applied to a power punch.

Similar reference characters indicate similar parts throughout the several views.

3 is the casing formed with a working cylinder 4 and preferably having formed integrally therewith the valve casing 5, the two parts being joined together by the stock 6.

7 is the cap screwed into the end of the cylinder 4 and formed with an elongated chamber 8 for a purpose hereinafter explained.

9 is the piston rod whose outer end 10 is formed for connection with a lever, clutch, or any other part to be actuated by the trip. Shoulders 11 are formed to strike against the cap to limit the return movement of the piston and rod.

12 is the piston; 13 is a leather cup packing which is air tight; 14 is a washer; and 15 is a nut screwed onto the reduced end of the piston rod to clamp the head, packing, and washer securely on the rod.

16 is the air port leading to the pressure side of the piston for admitting air to force the piston in one direction,—upwardly as shown in the drawings,—and to permit the air to exhaust therefrom; and 17 is a compression spring for forcing the piston in the opposite direction. The spring bears between the piston head and the upper end of the housing 8, and the cap is formed with shoulder 18 which limits the working stroke of the piston without undue compressing or injuring of the spring which at its maximum stress is held within the said housing.

It will be noted that, when unaffected by outside connections, the movement of the piston and rod is limited in both directions positively by the cap.

The valve casing 5 is located preferably close to the lower or pressure end of the working cylinder, and is formed with valve cylinder 19, an air inlet port 20, an exhaust port 21, and a number of small circumferentially alined ports 22 communicating with a counterbored hole 23, which in turn communicates with the port 16 to the working cylinder, and which is stopped up at its othewise open end by means of a plug 24. The purpose of the passages 22, 23, and 16 is, broadly speaking, to provide a port communicating between the valve and the working cylinder, the plug being provided as an incident to a convenient way of forming these ports and connecting them, and as well as a means of access to the smaller ports for cleaning if necessary. The object in the peculiar arrangement of the three smaller ports 22 will be presently explained.

The plunger or valve proper is made up of several parts as follows: 25 is the slotted projecting end to which the operating lever is attached. 26 is a head formed thereon and adapted to strike against the adjacent end of the valve casing. 27 is a short shoulder fitting quite snugly within the valve cylinder, and next follows an annular passage 30. Next is another shoulder 28, and then the stem proper is formed as a threaded rod 29 on which is mounted the leather cup packing 31 and the washer 32, these two elements being securely held thereon and clamped between the shoulder 28 and the screw-threaded sleeve, coupling, or nut 33, which is formed with a hexagon-shaped middle portion 34. The rod portion 35 of another portion of the valve proper is screwed into the end of the sleeve opposite the end into which the end 29 is screwed; and the washer 36 and cup packing 37 are securely held and clamped between the end of the sleeve and the shoulder 38. The plunger thence extends out of the casing, as shown at 39, is provided with a shoulder 40, between which and the nut 42 is fitted a sleeve 41. The nut may be held from becoming loose by means of a pin 43. 44 is a head for the casing formed with a shouldered portion 45 projecting slightly into the cylinder to form a seat, and also formed with a collar 46. The plunger is made up in this manner, partly for convenience in assembling and for accessibility, and partly for functional purposes hereafter described.

47 is a compression spring bearing between the nut 42 and the head 44.

51 is a bracket formed integrally with the valve casing, and pivoted thereto at 52 is the operating lever 53, the one end of which is pivotally connected at 54 with the valve proper, and the other end of which forms an operating handle and preferably provided with a number of holes 55 to any of which a suitable cord 60 may be attached for operating the same from a distance.

Formed integrally with the casing is a base-plate or plates 56 provided with bolt holes 57 by means of which the device as a whole may be attached to a punch press, or other machine, or in any place suitable for performing its functions.

From the foregoing description, it will be understood that the parts indicated by the numerals 25, 26, 27, 28, 29, 31, 32, 33, 34, 35, 36, 37, 38, 39, 41, 42, and 43 form the valve proper, with the passage 30 and the chamber between the cup packings; the parts enumerated being securely held together in the same relation to each other at all times during operation of the valve. The valve has axial reciprocating movement within the cylinder between two positions, one being shown in the full lines and the other in dotted outlines. The air-inlet port 20 is located as to be always in communication with the valve chamber between the two cup packings. The exhaust port is located so as to communicate with the passage 30 when the valve is in second position. The ports 22 are so located as to communicate with the passage 30 and exhaust port 21 when the valve is in first or normal position, and with the chamber between the packing cups when the valve is in second position, the shift being accomplished by axial movement of the valve, thereby moving the adjacent cup packing 31 from one side to the other of the ports 22.

If the leather packing cups were required to slide over a comparatively large opening in the contiguous wall of the chamber, a high air pressure within the chamber would tend to force the leather into such opening, thereby tearing and wearing away the leather rapidly. In order to overcome this difficulty and yet secure ample passage area, we provide the series of small circumferentially alined ports 22, and we find the body of the leather sufficiently rigid to withstand pressing thereinto, and we find that the packing moves over these small openings smoothly and without wearing away there perceptibly more than elsewhere.

The purpose of the spring 47 is to hold the valve in normal position as shown in the full lines in the drawings, and to return it to that position. The purpose of the lever 53 is to shift the valve to its second position.

The valve forms the subject-matter of a separate application, Serial No. 4,121, filed by us January 25, 1915.

Normally all parts are in the positions shown in the full lines in the drawings,

being held there by the springs 47 and 17; the pressure chamber of the working cylinder communicates with the atmosphere; and the valve chamber between the cup packings is filled with air at line pressure. Upon operating the lever to shift the valve to its second position, the exhaust is cut off from communication with the pressure chamber of the working cylinder and the air at line pressure is forced thereinto, moving the working piston to do its work. Upon release of the lever the parts are instantly restored to normal positions. In actual practice, the operation is ordinarily performed by giving the lever a quick jerk and quickly releasing it, as the air does its work almost instantly, and provision is usually made in the machine to which it is attached for restoring it, the machine, to its normal position ready for another phase or cycle of operation. However, we do not wish to be understood as confining ourselves to the use of our device with such automatically restoring machines.

Further to illustrate and explain the use of our trip reference is made to Fig. IV, in which 62 is a punch press such as is used for punching holes in boiler plates and other large work. 63 is the drive wheel, 64 represents the clutch mechanism, 65 is a trip rod connecting the clutch mechanism with the lever 67 which is pivoted to the frame at 66. Ordinarily this lever would be connected by means of a rod 68 with the foot lever 79 pivoted to the frame at 70, and such connection may be still maintained if desired, for use in case of the emergency of disconnecting the pneumatic trip. The pneumatic trip herein described is bolted to the frame, and the projecting end 10 of the piston rod is connected with an arm 72 depending from the clutch lever. 71 is a boiler plate or other work in the position in which it is held ready to receive the tool. The cord 60 is passed over a pulley 61 fastened to the frame, and thence its free end may be led to the position most convenient for the workman handling the sheet. It will be noted that by means of the cord, the single workman guiding the sheet may, from any position, easily trip the tool while holding the sheet. This is of importance in considering the fact that such sheets are frequently of great size and weight, it having been heretofore necessary, with the foot lever, to have another attendant at the foot lever down under the sheet.

Another valuable feature of our invention is the arrangement whereby the valve is balanced, there being no unequal pressures by the air upon different parts of the valve to force it or interfere with its free movement under influence of the spring and lever.

Another valuable feature is the close relation of the air under line pressure to the pressure chamber of the working cylinder, thereby economizing in air necessary to perform the functions of the device.

Another feature is that it is self-contained and compact, thereby simplifying its manufacture and as well its attachment and use. And, in addition, it is simple, durable, strong, and readily accessible as to all its parts.

58 is an oil cup. The lines 50 indicate the near ends of the flanges of the cup packings when the valve is in second position.

Movement of the valve is limited by the head 26 striking against the casing end, and by the sleeve 41 striking against the collar 46.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In a pneumatic trip, the combination of a casing integrally formed with a working cylinder, a valve chamber, a port connecting the cylinder and the chamber, inlet and exhaust ports for the valve chamber, a plate for attachment to a machine frame, and a pivot arm, said valve chamber being located at one end of the working cylinder and at one side thereof; a piston and a piston rod in the working cylinder, said rod being formed for connection with clutch-tripping mechanism, a spring for forcing the piston toward the end of the working cylinder at which the valve chamber is located, a valve in the valve chamber, and a lever pivoted to said pivot arm and a spring for operating said valve in opposite directions.

2. In a pneumatic trip, the combination of a casing formed with a working cylinder, a valve chamber, means for attachment to a machine frame, a pivot arm, and suitable ports; a piston in the working cylinder adapted to be moved in one direction by the motive fluid, a spring adapted to move the piston in the opposite direction, a piston rod secured to said piston and formed for attachment to clutch-tripping mechanism, a valve in said valve chamber for controlling the flow of the motive fluid, and a lever pivoted to said pivot arm and a spring for operating the valve in opposite directions.

3. In a pneumatic trip, the combination of a casing formed with a working cylinder, a valve chamber, means for attachment to a machine frame, a pivot arm, and suitable ports; a piston and piston rod in the working cylinder, the piston rod being formed for connection with clutch-tripping mechanism, and the piston being adapted to be moved in one direction by the pressure fluid, means for moving the piston in the other direction, a three-way valve in said valve chamber for controlling the flow of the motive fluid to and from the working cylinder,

said valve normally opening said working cylinder to the exhaust, a lever secured to the valve and pivoted to said pivot arm for operating said valve to direct the fluid under pressure into said working cylinder and cut off the exhaust, and means for restoring said valve to normal position.

4. In a pneumatic trip, the combination of a casing formed with a working cylinder, a valve chamber, means for attachment to a machine frame, a pivot arm, and suitable ports; a piston and piston rod in the working cylinder formed for connection with clutch-tripping mechanism, normally in non-tripping position, and operable to tripping position by the motive fluid, a three-way valve in said valve chamber for controlling the flow of the motive fluid to and from said working cylinder, said valve normally opening said cylinder to the exhaust, a lever secured to the valve and pivoted to the pivot arm for operating said valve to direct the fluid under pressure to the working cylinder and cut off the exhaust, and springs for restoring the said movable parts to normal positions.

In testimony whereof we have affixed our signatures in presence of two witnesses.

ARCHIE M. BAIRD.
HARVEY D. PALMER.

Witnesses:
C. J. ROSEN,
J. M. STARK.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."